REMARKS

I. Status of Claims

Claims 1, 2 and 4-16 are canceled without prejudice or disclaimer.

Claim 17 is amended to incorporate the subject matter of Claim 1.

No new matter is added, and the Amendment places the application in condition for allowance, or at the very least, reduces issues on appeal. Accordingly, Applicants respectfully request entry and consideration of the Amendment. Upon entry of the Amendment, Claims 17-23 will be pending.

II. Statement of Substance of Interview

An Examiner Interview conducted on February 2, 2011. During the Interview the differences between the inventions of Mikoshiba and MacFarlane and the presently claimed invention were discussed. The Examiner pointed out that a showing of unexpectedly superior properties was not commensurate with the scope of the claims because the claims were not directed to solar cells. Accordingly, Claims 1, 2 and 4-16 are deleted herewith, leaving Claims 17-23 directed to solar cells under consideration.

III. Response to Claim Rejections Under 35 U.S.C. § 103(a)

A. Claims 1, 2 and 4-20 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Mikoshiba et al. (U.S. Patent No. 6,384,321) in view of MacFarlane ("Ionic liquidsbased on imidazolium, ammonium, and pyrrolidinium salts of the dicyanamide ion", Green Chemistry, 2002).

B. Claims 21-23 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Mikoshiba in view of MacFarlane, and further in view of Koyanagi et al. (U.S. Patent Application Publication No. 2003/0150485).

Without acquiescing to the merits, Claims 1, 2 and 4-16 are canceled.

Applicants respectfully traverse the § 103(a) rejection of Claims 17-23, at least for the following reasons.

Claim 17 is directed to a dye-sensitized solar cell comprising a transparent electrode substrate, a working electrode having an oxide semiconductive porous film formed on the transparent electrode substrate which is made of oxide semiconductive fine particles and having a photo-sensitizing dye absorbed thereon, and a counter electrode provided opposing the working electrode, and an electrolyte layer comprising the electrolyte composition which is provided between the working electrode and the counter electrode, and wherein the electrolyte composition comprises an ionic liquid and a halogen-based redox pair, wherein the ionic liquid includes dicyanoamide anions. In other words, the present claims are directed to a dye-sensitized solar cell.

First, Applicants respectfully disagree with the Examiner's basis for rejection of the present claims as allegedly being obvious over the teachings of Mikoshiba and MacFarlane. As stated in §§ 2143.01(V) and (VI) of the MPEP, the proposed modification to a reference cannot render the invention disclosed in that reference unsatisfactory for its intended purpose, nor can a proposed modification change the principle of operation of the reference invention.

The electrolyte composition of Mikoshiba contains a substituted imidazolium iodide, a halogen-containing compound dissolved in the electrolyte, and a compound dissolved in the electrolyte and containing at least one element selected from N, P and S, the compound being

capable of forming an onium salt with the halogen-containing compound. Based on the description at column 5, lines 26-63, the anion of the substituted imidazolium iodide participates in the reversible redox coupling in the electrolyte, along with the halogen containing compound. Accordingly, if the iodide compound is replaced with the dicyanamide compound of MacFarlane, as is asserted by the Examiner, the proposed modification would change the principle of operation of the electrolyte composition of MacFarlane. Additionally, the dicyanamide cannot form an onium salt with the iodide compound.

Second, Applicants reiterate that there is no motivation to combine the inventions of Mikoshiba and MacFarlane because the former teaches the use of iodide and water in the electrolyte composition, whereas the latter teaches away from using iodide and water. Therefore, a combining the two would render the inventions unsatisfactory for their intended purposes.

Third, the presently claimed invention can achieve the following unexpected effects.

(1) Since an ionic liquid including dicyanoamide anions as the anions has lower viscosity than conventional ionic liquids, it can be expected that it will exhibit effects such as improving the rate of charge transfer in the electrolyte. See, for example, page 6, lines 19-21 of the specification.

(2) Furthermore, the presently claimed electrolyte composition is beneficial in that a dye sensitizing solar cell using the electrolyte composition provides a higher electromotive force (open-circuit voltage) when compared with the case in which an ionic liquid is used. See, for example, page 6, lines 21-24 of the specification.

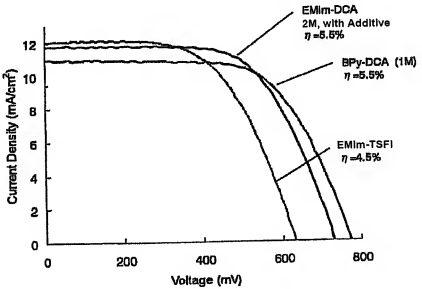
(3) Since the main component of the electrolyte composition is the ionic liquid including dicyanoamide anions as anions, it can achieve both a higher current characteristic and a higher

voltage characteristic and therefore provides a better photoelectric conversion characteristic. See, for example, page 3, lines 18-20 and page 10, lines 8-12 of the specification.

Specifically, experimental data showing the unexpectedly superior properties of effect (3) discussed above, is shown below in Graph 1.

Graph 1 shows photoelectric conversion characteristic of the test cells EMIm-DCA (No. 1 at Table 1 of the specification), BPy-DCA (No. 3 at Table 1 of the specification), and EMIm-TFSI (No. 5 at Table 1 of the specification).

As shown in Graph 1, when the dicyanoamide anions is used as anions, i.e., EMIm-DCA and BPy-DCA, both short-circuit current density (Jsc) and open-circuit voltage (Voc) are high, and excellent photoelectric conversion characteristic is observed. On the other hand, while a sulfonamide is used as anions, i.e., EMIm-TFSI, the open-circuit voltage (Voc) becomes lower.



Graph 1

MacFarlane discloses that ionic liquid including dicyanoamide anions as anions has a low viscosity. Since the viscosity is low, the diffusion coefficient becomes higher. Therefore, one of

ordinary skill in the art would expect that the current value would rise. However, as shown in Graph 1, the ionic liquid including dicyanoamide anions as anions have a higher threshold value of the voltage for obtaining a current as compared with EMIm-TFSI.

As shown above, the ionic liquid including dicyanoamide anions as anions shows unexpected behaviors while used in a dye sensitizing solar cell, and superior effects such that both a higher current characteristic and a higher voltage characteristic can be achieved. As a result, a higher photoelectric conversion characteristic can be achieved.

Moreover, arguably, the closest example in the prior art are the compounds at column 5, lines 3-61 of Mikoshiba, all of which contain an iodide anion. MPEP § 716.02(e)(III) only requires that the claimed invention be compared with the closest prior art.

In view of the above, Applicants respectfully traverse the § 103(a) rejection of Claims 1, 2 and 4-20, and submit that the claims are patentable over Mikoshiba in view of MacFarlane. Claims 22 and 23 are also patentable, at least by virtue of their dependence from Claim 1, and because Konayagi does not cure the above discussed deficiencies in Mikoshiba and MacFarlane.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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